Proximity-effects correction in photonic crystals with NanoPECS

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Integrated optical devices are often patterned using electron-beam lithography. In densely-packed structures such as, e.g., photonic crystals, proximity effects play in increasingly important role and degrade the pattern-transfer accuracy for acceleration voltages above 20kV. We have developed NanoPECS, an highly accurate tool for the correction of proximity effects. We have tested the suitability of various proximity functions. We have shown analytically that the double-gaussian function leads to unphysical ripples in the deposited energy of 2% peak-to-peak while the double-gaussian combined with an exponential term leads to much better pattern transfer in the resist with ripples of the order of 0.5%. Finally, we have applied NanoPECS to the correction of GaAs-based photonic crystals and shown that a hole-radius variation of 3.5% can be achieved compared to a 5% variation for a less accurate software.